PATENTS • DESIGNS • COPYRIGHT • TRADE MARKS
The Patent Office

INVESTOR IN PEOPLE

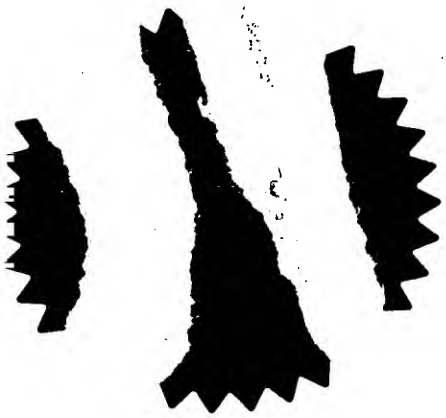
The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.



Signed Stephen Hordley

Dated 10 OCT 2001

Patents Form 1/77

Pa[illegible] Act 19[illegible]
(Rule 16)

THE PATENT OFFICE
26 MAR 1999
RECEIVED BY HAND

29MAR99 E436188-10 D00027
P01/7700 0.00 - 9907135.9

The Patent Office

1/77

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office
Cardiff Road
Newport
Gwent NP9 1RH

1.	**Your reference**	31.15.69733
2.	**Patent app** *(The Patent*	**9907135.9** 26 MAR 1999
3.	**Full name, address and postcode of the or of each applicant** *(underline all surnames)*	Carlsberg-Tetley Brewing Limited Bridge Street Northampton NN1 1PZ
	Patents ADP number *(if you know it)*	6356349002
	If the applicant is a corporate body, give country/state of incorporation	United Kingdom
4.	**Title of the invention**	Beer Dispenser
5.	**Name of your agent** *(if you have one)*	Frank B. Dehn & Co.
	"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*	179 Queen Victoria Street London EC4V 4EL
	Patents ADP number *(if you know it)*	166001

6.	**If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and** *(if you know it)* **the or each application number**	**Country**	**Priority application number** *(if you know it)*	**Date of filing** *(day / month / year)*

7.	**If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application**	**Number of earlier application**	**Date of filing** *(day / month / year)*

8.	**Is a statement of inventorship and of right to grant of a patent required in support of this request?** *(Answer 'Yes' if:* *a) any applicant named in part 3 is not an inventor, or* *b) there is an inventor who is not named as an applicant, or* *c) any named applicant is a corporate body.* *See note (d))*	YES

9. **Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document**

Continuation sheets of this form	
Description	11
Claim(s)	3
Abstract	
Drawing(s)	6 & 6

10. **If you are also filing any of the following, state how many against each item.**

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. **I/We request the grant of a patent on the basis of this application.**

Signature **Date** 26 March 1999

12. **Name and daytime telephone number of person to contact in the United Kingdom**

Robert Jackson
0171 206 0600

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) *If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.*
b) *Write your answers in capital letters using black ink or you may type them.*
c) *If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s) of the form. Any continuation sheet should be attached to this form.*
d) *If you have answered 'Yes', Patents Form 7/77 will need to be filed.*
e) *Once you have filled in the form you must remember to sign and date it.*
f) *For details of the fee and ways to pay please contact the Patent Office.*

69733.604

Beer Dispenser

The present invention relates to an apparatus for dispensing beverages such as beer and in particular, but not exclusively, to a beer tap for dispensing draught beer.

Taps for dispensing beer are well known. One common tap used by pubs and bars for dispensing draught beer is an Alumasc® tap as supplied by Alumasc Ltd. A schematic representation of such a tap and the flow within it is shown in Figures 1 and 2. The tap comprises an inlet pipe 1 which opens into a cylindrical chamber 2. A valve head 3 is centrally located in the chamber and is arranged to close against a valve seat 4 which is formed on the upper end of a depending dispensing tube 5. The diameter of the valve head 3 is significantly less than the internal diameter of the chamber 2 so that beer may flow around all sides of the valve head to reach the dispensing tube 5. Thus, in use the beer flows into the tap through the inlet pipe, flows against the valve head 3 and then down through the dispensing tube. As can be seen from Figures 1 and 2, on impacting the valve head, some beer will flow in either direction around the head.

The inventor has recognised that this flow pattern gives rise to turbulence such that stagnation points occur within the chamber 2, particularly in the region opposite the inlet pipe. This causes flow energy to be used up and thus a relatively large pressure drop in the beer is produced across the tap. Thus, the beer in the kegs must be provided at a relatively high pressure to allow for this pressure drop. In addition, the turbulent flow through the taps may have a detrimental effect on the quality of the beer being dispensed.

It is often important that beer be dispensed with an attractive head of foam. The head on draught beer is

known to be produced from the breakout or separation of gas in the beer to produce bubbles and a "tight" creamy head formed of small bubbles is usually considered most desirable.

Many different methods have been tried in the past to produce a high quality head on draught beer. For example, nitrogen may be added to the beer and also a flow restrictor is usually provided in the base of the dispensing tap.

Such flow restrictors traditionally are flat discs containing five holes each having a diameter of from 0.5 to 1 mm. Before exiting the tap, beer builds up behind the flow restrictor due to the decreased flow aperture provided by the holes. Thus, there is a pressure drop across the flow restrictor which causes gas breakout as required to produce a head on the beer.

However, there are two problems with these known taps having flow restrictors. Firstly, the beer in the kegs must be provided at a high pressure to allow for the pressure drop across the flow restrictor. Secondly the gas breakout forms relatively large bubbles such that the head formed on the draught beer is not as tight or creamy as might be hoped for.

Viewed from a first aspect, the present invention provides a beverage dispensing apparatus, the apparatus being formed so as in use to provide a vortexial motion in the mass of beverage flowing through the apparatus.

A vortexial motion in the mass of the beverage is to be distinguished from the existence of localised vortices which may occur in the turbulent-flow regions of the prior art tap which the inventors have found to be disadvantageous. Unlike such random turbulent motion, in an apparatus according to the invention substantially all of the beverage flows about a common axis.

In the vortexial flow of the invention, a low pressure area is produced at the centre of the vortex so

that the pressure in that region falls below equilibrium pressure and thus results in gas separating out from the liquid beverage. Since the gas breakout is achieved without the need for a flow restrictor, the pressure drop associated with these devices does not occur. Consequently the beverage may enter the apparatus at a lower pressure which reduces the amount of undesirable large bubbles which are produced. Thus a high quality head is formed on the draught beverage dispensed from the apparatus of the invention. In addition, the requirement of a lower pressure is of course advantageous in itself; costs are reduced because lower strength materials and construction may safely be used.

It is not critical to the invention how the vortex is produced but it has been found particularly effective to provide the apparatus with a flow chamber having a substantially circular cross section in which the vortexial motion is induced together with an inlet leading to that chamber and an outlet leading therefrom.

A particularly effective way to induce the vortexial motion in such a chamber is for the inlet to extend substantially at a tangent to the circular cross section of the flow chamber. In this way, beverage flowing into the apparatus flows into the chamber from the inlet and along the inner face of its side wall. Thus the beverage flows around the chamber and thereby sets up a vortexial flow.

The beverage could be supplied to the flow chamber from any direction, but preferably the beverage inlet comprises a conduit which extends substantially horizontally to the flow chamber so that the flow path of the beverage forms a tangent to the flow chamber, as previously discussed.

Although the action of the beverage flowing around the walls of the flow chamber is sufficient to cause vortexial motion, this may be enhanced by providing a vortex finder within the flow chamber aligned in

relation to the beverage inlet such that, in use, beverage flowing into the flow chamber is guided in a circular path between the outer surface of the vortex finder and the inner wall of the flow chamber. Thus, with a vortex finder provided as described above, the beer flowing through the apparatus is further encouraged to flow cyclically around the flow chamber.

The vortex finder could be of any form which provides the required flow pattern. Preferably however, the vortex finder comprises a portion in the form of a cylinder.

Still more preferably, the vortex finder further comprises a conic or frusto-conic part provided at the downstream end thereof (i.e. the end closer to the outlet). This form of vortex finder further encourages the beer to flow helically.

Since draught beverages are kept under pressure which propels the beverage through the dispensing system, the apparatus of the invention could be arranged in any orientation. Indeed, it could be provided as a mobile, hand held device. However, it is usually most convenient to dispense beverages from a generally vertical outlet e.g. fastened to a counter. It is therefore preferred that the flow chamber comprises an upstream portion defining a vortex finding chamber in which the vortex finder is located and a downstream portion depending from the upstream portion. In use the apparatus may be arranged substantially vertically such that the beverage flows helically downwardly through the downstream portion of the flow chamber assisted by the action of gravity and is dispensed through the outlet.

The flow chamber could be of any form which allowed vortexial flow to form and be maintained. For example, it could be in the form of a hollow cylinder. However, preferably the flow chamber is formed to enhance the vortex generating effect, for example by providing it with a main body having a circular cross section wherein

at least the downstream portion thereof decreases in diameter along its axis in the downstream flow direction.

When the tap is formed as described above, the vortexial flow of the beverage will be accelerated as it flows towards the distal end of the flow chamber. This results in a gradually increasing pressure drop which increases gas breakout and thus improves the quality of the head which is formed.

The beverage could in use be allowed to flow directly out of the flow chamber. However, beverage flowing out without any further guidance may have a tendency to form a triangulated or cone shape. Thus preferably, a flow director is provided, ideally in the downstream portion, near the exit point. Such devices are well known in the art. This enables beverage to flow out of the apparatus in a smooth straight column without significantly restricting its flow.

The invention in its simpler forms may be used in conjunction with an associated flow control such as a valve or tap. However, it is particularly preferred for the flow control to be formed integrally such that there is provided a tap which may be used as a direct replacement of the prior art taps previously discussed.

An especially convenient way of achieving this objective is for the previously described vortex finder to be in the form of a valve head which acts in co-operation with the surfaces of the flow chamber and/or the outlet tube to control the flow of beverage through the apparatus.

Although the diameter of the flow chamber cross section could decrease evenly along its axis in the downstream flow direction, particularly when providing a vortex finder on the valve head it is preferable that the vortex finding chamber defined by the upper portion of the flow chamber have a constant cross sectional diameter, i.e. be in the form of a hollow cylinder.

This simplifies the design and manufacture of the valve head. The cross sectional diameter of the downstream portion of the flow chamber may then reduce in the downstream direction of flow as described above.

Since this valve arrangement is such that the beverage flows around the vortex finder (which forms the valve head) in a single direction in order to produce the vortexial flow, it follows that the stagnation points and turbulent flow associated with the prior art taps are significantly reduced if not eliminated. Consequently, there is a much smaller pressure drop across the valve which means that the pressure under which the beverage is kept may be further reduced.

This valve arrangement is, in itself, believed to be inventive and therefore, viewed from a second aspect, the invention provides a beverage dispensing tap comprising an inlet conduit, a flow directing chamber, a valve member located within the flow directing chamber and an outlet conduit leading from the flow directing chamber, wherein the inlet conduit is arranged in relation to the flow directing chamber such that beverage flowing into the tap is directed to flow around the valve member substantially in one direction.

Since this arrangement significantly reduces the pressure drop across the valve, it may be useful in many types of dispensing apparatus. However, it is particularly advantageous for the tap to be provided with the preferred features discussed above. In particular, the outlet conduit preferably depends from the flow directing chamber and is arranged such that the flow of beverage around the valve member establishes a vortexial flow within the outlet conduit.

The flow directing chamber may be cylindrical, conical or frustoconical and the valve member will preferably be similar such that a flow passage with concentric sides is formed.

The valve member may act against a valve seat

formed at the upstream end of the outlet conduit. However, this may interfere with the desired vortexial flow and so it is preferred for the valve member to be provided with a portion arranged to close the flow path from the inlet to the flow directing chamber. This may, for example, be achieved by providing the valve member with a vortex finder portion having a diameter significantly less than that of the flow directing chamber and a valve portion having a diameter substantially the same as the inside diameter of the flow directing chamber, the valve member being axially movable within the flow directing chamber in such a way that the valve portion opens and closes the inlet conduit. Preferably a suitable sealing material is provided around the valve portion.

The apparatus of the invention could be made of any suitable material. Such materials include for example glass or perspex. Preferably however, the tap is made of a corrosion resistant metal such as stainless steel.

The invention also provides a novel and improved way of dispensing a beverage and so, from a third aspect, the present invention provides a method of dispensing a draught beverage by forming a vortexial flow in the mass of the beverage as it is dispensed.

According to a still further aspect of the invention there is provided a method of dispensing a beverage comprising supplying the beverage to a flow directing chamber having a valve member located therein such that the beverage flows around the valve member substantially in one direction before flowing out of the chamber and being dispensed.

Preferably the methods are performed using an apparatus as previously described.

Certain embodiments of the invention will now be described, by way of example only, and with reference to the accompanying drawings, in which:

Figure 1 is a schematic sectional view of a beer

dispensing tap according to the prior art;

Figure 2 is a schematic sectional view along line A-A of Fig. 1;

Figure 3 is a diagrammatic view showing the connection between a keg of beer and a beer dispensing apparatus including a tap according to the invention;

Figure 4 is a longitudinal sectional view of a first embodiment of a tap according to the invention;

Figure 5 is a section on B-B through the tap of Figure 4;

Figure 6 is a longitudinal sectional view of a second embodiment of a tap according to the invention, having a sealing valve shown in the closed position; and

Figure 7 is a longitudinal sectional view of the tap of Figure 6, with the sealing valve shown in the open position.

Like reference numerals are used for the corresponding parts of the two embodiments.

Figure 3 illustrates a beer dispensing system including a tap according to the first embodiment of the invention. The dispensing arrangement is otherwise standard. Tap 6 is connected via a pipe 7 to a remote cooler 8 of known form. A valve 9 is provided in the pipe 7 so as to control the supply of beer to the tap. Although the valve is shown here as being provided in the pipe remote from the tap, in the second embodiment of the invention, the valve is provided integrally with the tap, as will be described later in more detail.

The beer is supplied to the cooler from a keg 10 which is connected to the cooler by a pipe 12. The pressure of the beer in the system is controlled by a gas cylinder 14 and pressure gauge 16 which are connected to the keg via a further pipe 17.

As is conventional, the draught beer is supplied under pressure and it is this pressure which forms the beer through the dispensing systems. The gas also provides the beer with "condition" and allows the

formation of a good head on the beer when dispensed.

The first embodiment of a beer dispensing tap 6 according to the invention is shown in more detail in Figures 4 and 5. The tap shown is made of stainless steel, although it could alternatively be made of perspex or glass.

The tap 6 has an inlet 18 which extends horizontally (as illustrated) and tangentially to the main tap body 20. The inlet is in use connected to a pipe 7 as shown in Figure 3. Thus when valve 9 of Figure 3 is opened, beer flows into the tap main body via the inlet 18.

The tap main body 20 is made up of an upstream portion which forms a vortex finding chamber 22 and a downstream portion 24 depending from the vortex finding chamber.

The vortex finding chamber 22 is annular in form having inner 26 and outer 28 walls. The inner wall 26 forms a so-called vortex finder. Thus, beer flowing into the vortex finding chamber will flow helically around the vortex finder between its inner and outer walls so as to set up a vortexial flow in the body of the beer. The downstream portion 24 is frusto-conical in form, having a cross sectional diameter which decreases in the direction of through-flow of the beer. Therefore, on entering the downstream portion of the tap, the beer will continue to flow helically through the tap and will be accelerated towards the tap exit 30 due to the decreasing diameter of the downstream portion.

The tap described in this embodiment could be held in any orientation to dispense beer. It is believed however that the best results would be obtained when the tap was oriented vertically.

An alternative embodiment of a beer dispensing tap 6 according to the invention is shown in Figure 6. The tap 6 itself has a main body 20 which has a straight

hollow cylindrical upper portion 22 and a hollow tapering portion 24 extending below it. An inlet pipe 18 is provided in the straight upper portion which joins the upper portion at a tangent thereto. A valve 32 for opening and closing the tap is also provided in the upper portion thereof. The valve is operated by means of a mechanism (not shown) which acts on a compression spring 34 located above the valve head which biases the valve closed.

A vortex finder 36 having a cylindrical form of a diameter significantly smaller than the upper tap body is attached to the valve. Therefore, when the valve is depressed, the vortex finder extends below the inlet pipe and the wider part of the valve blocks the inlet to the tap. However, as shown in Figure 7, when the valve is raised to open the tap, the vortex finder is located at the height of the inlet pipe. Thus an annular flow chamber (or vortex finding chamber) is defined between the wall of the vortex finder and the inner surface of the upper portion of the tap body when the valve is open. Therefore, beer flowing into the tap will be directed helically around the inside of the tap with the help of the vortex finder.

As seen in Figures 6 and 7, a flow director or straightener 38 is attached to the base of the tap body 6. Any known form of flow straightener could be used but, as seen in the drawings, the preferred form of flow straightener, comprises a hollow nozzle 40 with a vane 42 extending diametrically across it. In one possible form, the flow straightener is connected to the downstream face of a flow restrictor in which the majority of the disc has been removed so as to provide a means of attaching the flow straightener to the tap without restricting the flow of beer through the tap more than is necessary.

Some initial tests of taps according to the invention have shown that the maximum pressure drop in

the beer being dispensed through the whole tap is approximately 0.5 bar (50 kPa). In contrast, the pressure drop across a prior art tap having a flow pattern as shown in Figures 1 and 2 is approximately 1.5 bar (150 kPa). This pressure drop is made up of a pressure drop of up to 1 bar (100 kPa) across a standard flow restrictor disk and a further pressure drop of about 0.5 bar (50 kPa) across the tap due to loss of energy in the beer flowing through the tap.

Thus, as the pressure drop across the tap of the invention is only about one third of the pressure drop found in prior art dispensing systems, the beer in the keg can be provided at a much lower pressure. This is beneficial as it means that beer provided in kegs for dispensing from taps according to the invention can be provided at a much lower top pressure. This has the result that the beer which is dispensed has a smooth and creamy head. Furthermore, the need to contain lower pressures in the system means that lower strength, and therefore lower cost components may be used in the dispensing system.

Claims

1. Beverage dispensing apparatus, the apparatus being formed so as in use to provide a vortexial motion in the mass of beverage flowing through the apparatus.

2. A beverage dispensing apparatus as claimed in claim 1, having a flow chamber having a substantially circular cross section, an inlet and an outlet.

3. A beverage dispensing apparatus as claimed in claim 2, wherein the inlet extends substantially at a tangent to the circular cross section of the flow chamber.

4. A beverage dispensing apparatus as claimed in claim 3, wherein the inlet is a conduit which extends substantially horizontally to the flow chamber.

5. A beverage dispensing apparatus as claimed in any of claims 2 to 4, a vortex finder being provided within the flow chamber aligned in relation to the inlet such that in use, beverage flowing into the flow chamber is guided in a circular path between the surface of the vortex finder and the inner face of the flow chamber.

6. A beverage dispensing apparatus as claimed in claim 5, wherein the vortex finder comprises a portion in the form of a cylinder.

7. A beverage dispensing apparatus as claimed in claim 6, wherein the vortex finder further comprises a conic or frusto-conic part provided at the downstream end thereof.

8. A beverage dispensing apparatus as claimed in claim 6 or 7, wherein the vortex finder is provided integrally with a valve head.

9. A beverage dispensing apparatus as claimed in any preceding claim, the apparatus being arranged to be oriented substantially vertically in use such that the beverage flows helically downwardly through the apparatus under the action of gravity.

10. A beverage dispensing apparatus as claimed in claims 2 to 9, wherein the circular cross section of at least a part of the flow chamber decreases in diameter along its axis in the downstream flow direction.

11. A beverage dispensing apparatus as claimed in any preceding claim, wherein a flow director is provided on the tap to smooth the flow of beverage leaving the tap.

12. A beverage dispensing apparatus as claimed in any of claims 2 to 10, the flow chamber comprising a hollow cylindrical upstream portion defining a vortex finding chamber and a conical or frusto-conical downstream portion depending therefrom.

13. A beverage dispensing tap comprising an inlet conduit, a flow directing chamber, a valve member located within the flow directing chamber and an outlet conduit leading from the flow directing chamber, wherein the inlet conduit is arranged in relation to the flow directing chamber such that beverage flowing into the tap is directed to flow around the valve member substantially in one direction.

14. A beverage dispensing apparatus as claimed in claiim 13, wherein the outlet conduit depends from the flow directing chamber and is arranged such that the flow of beverage around the valve member establishes a vortexial flow within the outlet conduit.

15. A beverage dispensing apparatus as claimed in claim 13 or 14, wherein the valve member is provided with a vortex finding portion having a diameter significantly less than the flow directing chamber and a valve portion having a diameter substantially the same as the inside diameter of the flow directing chamber, the valve member being axially movable within the flow directing chamber in such a way that the valve portion opens and closes the inlet conduit.

16. A beverage dispensing apparatus as claimed in any preceding claim, the apparatus being made of stainless steel.

17. A method of dispensing a beverage comprising forming a vortexial flow in the mass of beverage as it is dispensed.

18. A method of dispensing a beverage comprising supplying the beverage to a flow directing chamber having a valve member located therein such that the beverage flows around the valve member substantially in one direction before flowing out of the chamber and being dispensed.

19. A method of dispensing a beverage as claimed in claim 17 or 18, using the apparatus as claimed in any of claims 1 to 16.

20. A tap substantially as herein described and with reference to the accompanying drawings.

21. A method of dispensing beer substantially as herein described and with reference to the accompanying drawings.

FIG. 1

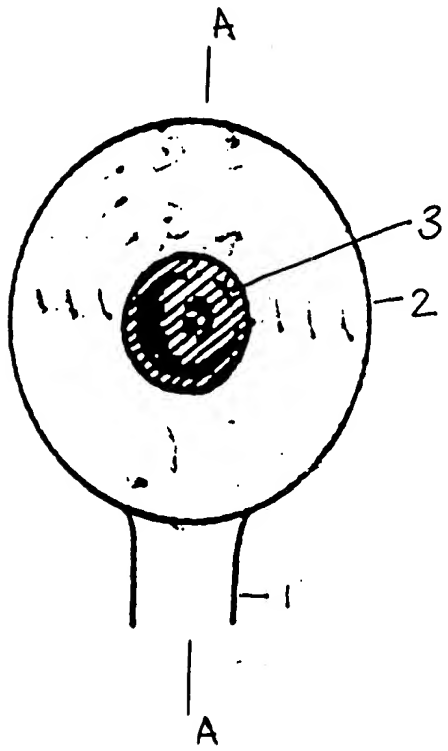


FIG. 2

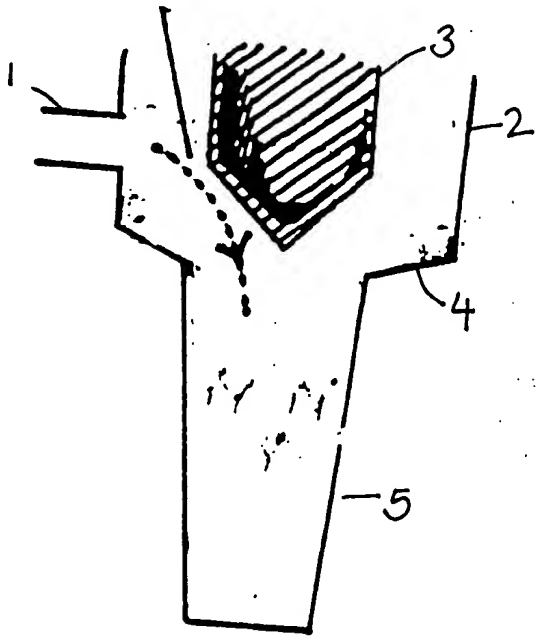


FIG. 3

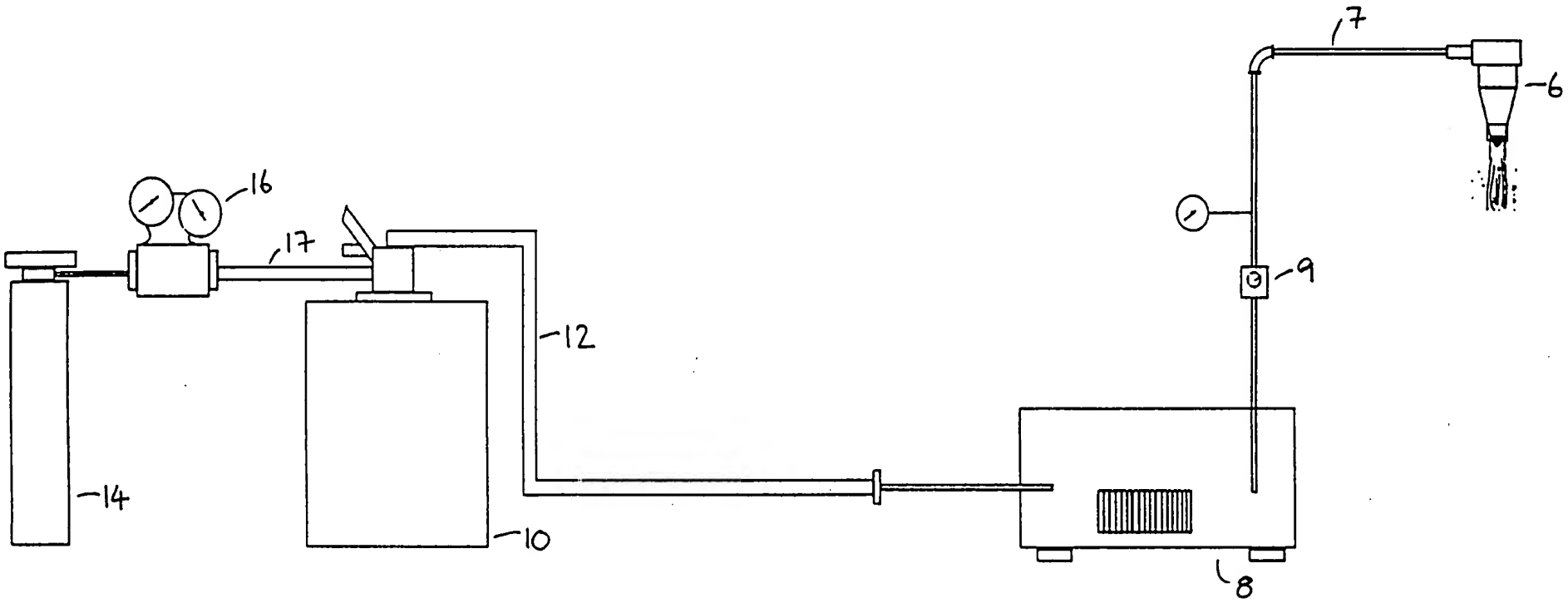
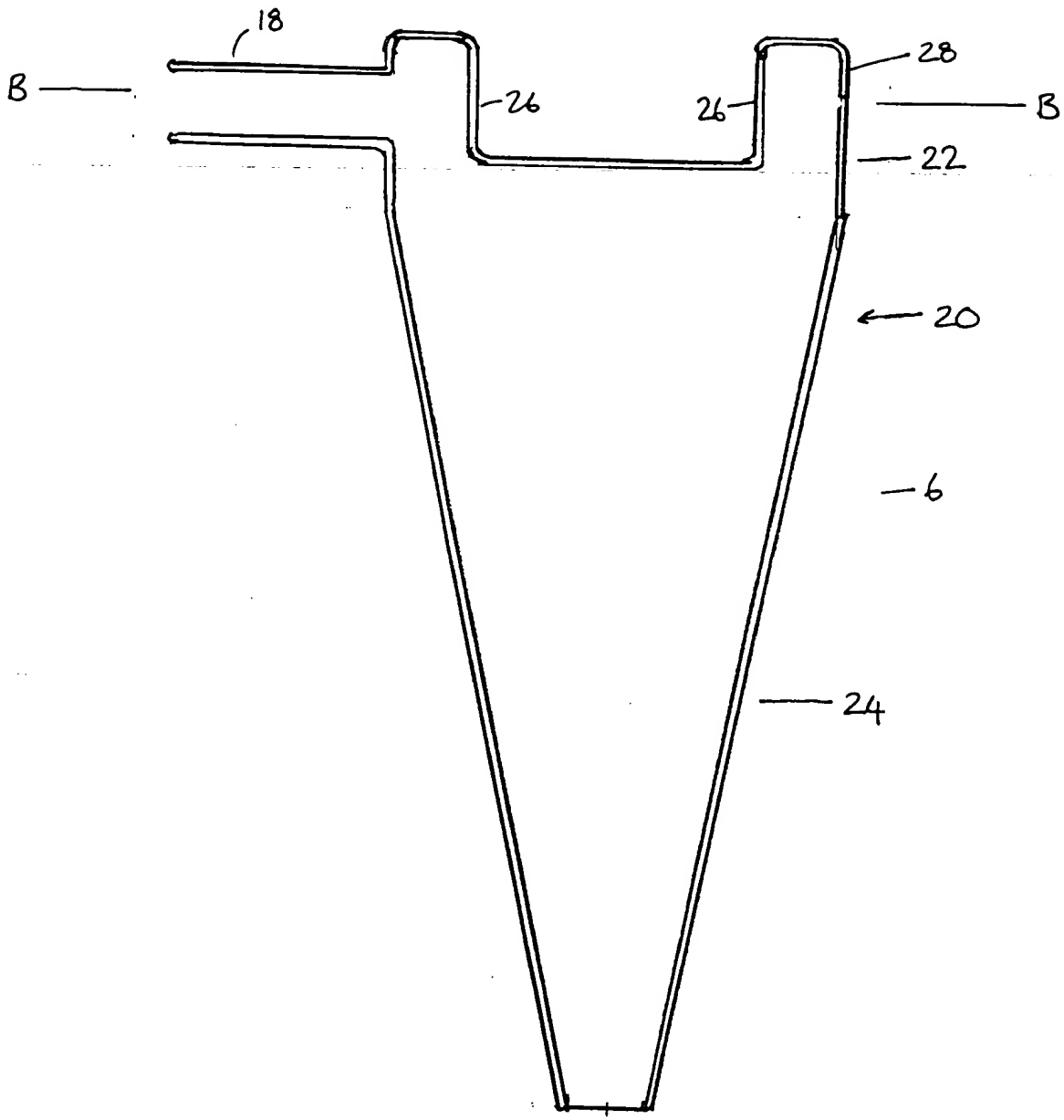


FIG. 4



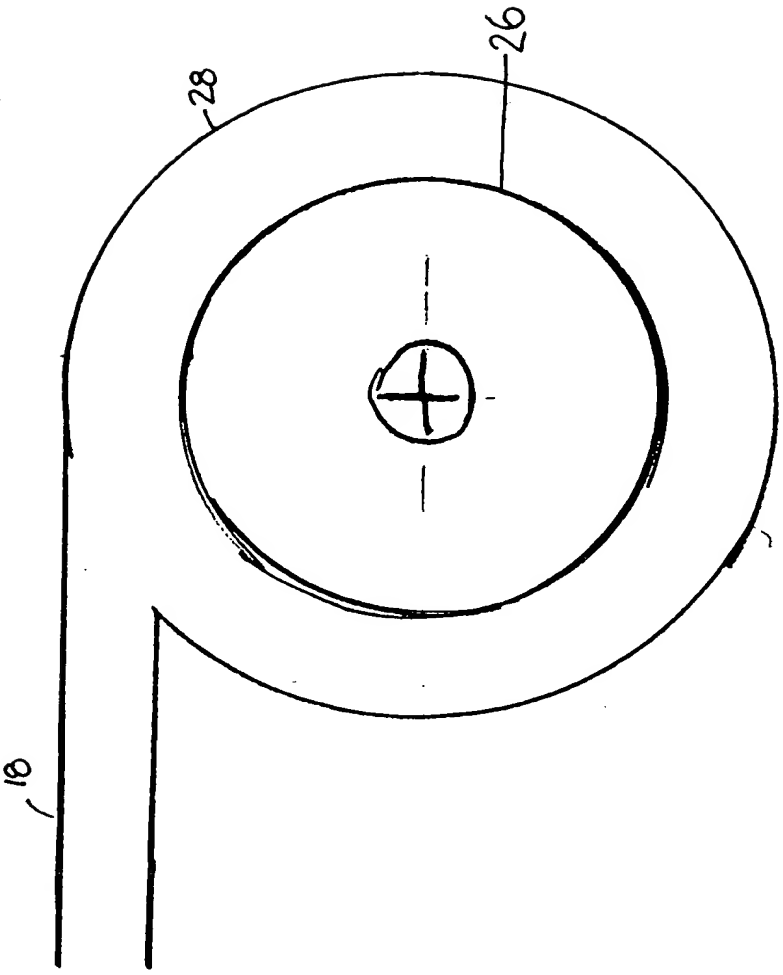


FIG. 5

FIG. 6

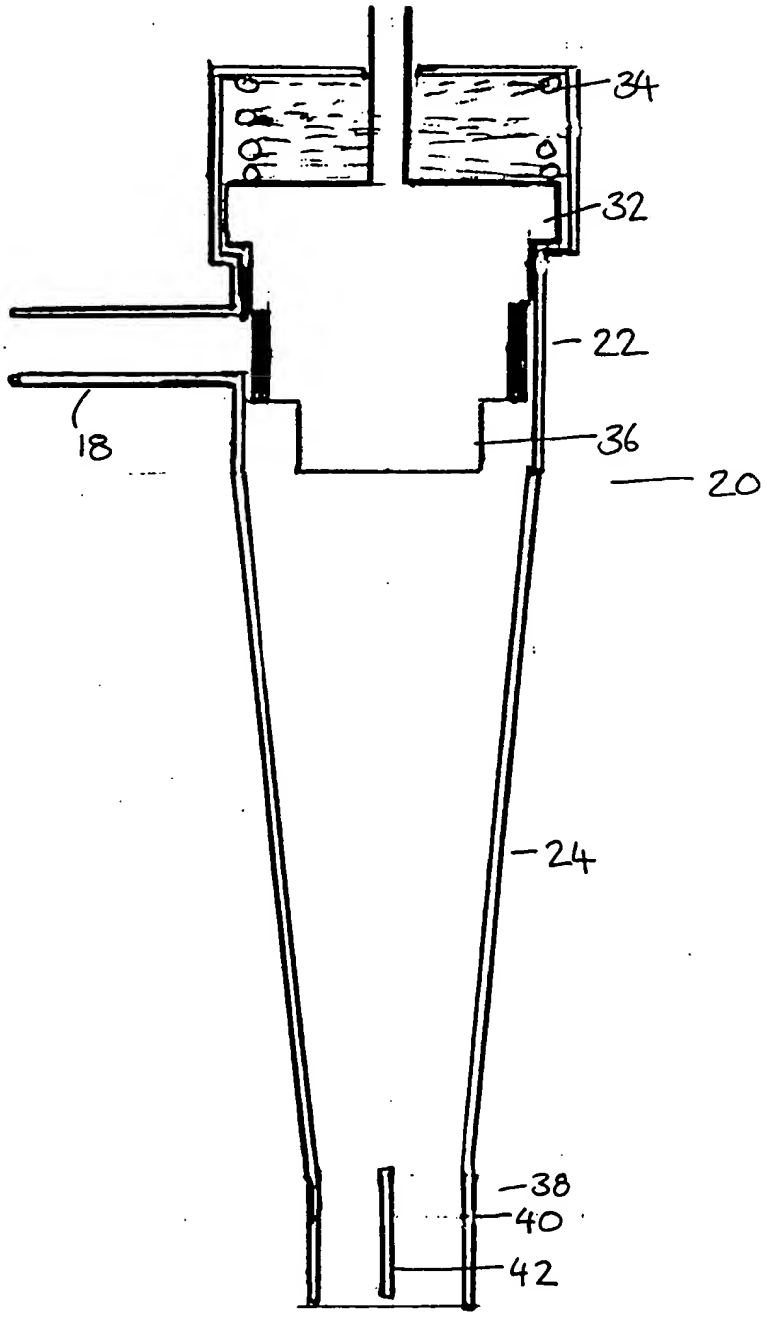


FIG. 7